

John M. Guynn

From: Randy Smith [rsmith@earthshell.com]
Sent: Saturday, September 17, 2005 6:08 PM
To: John M. Guynn
Subject: FW: REVIEW: Wrap Model
Importance: High
Attachments: Wrap Model - Rev 003 022001.xls

From: Matt Loos
Sent: Sunday, February 25, 2001 12:07 PM
To: Donna Balinkie; Kishan Khemani; Randy Smith
Cc: Matt Loos; Scott Houston
Subject: REVIEW: Wrap Model
Importance: High

Folks,

Please find attached the latest Wrap Model for INTERNAL review. This latest version requires a detailed review by those to whom this e-mail is addressed. Ideally, we would be face-to-face for this review, but there may be some tweaks to make before that session occurs this week. I welcome all input.

- 1) The Wrap model now contains a fairly exhaustive Assumptions tab. The Assumptions tab is the ONLY input area, and maintains all assumptions that drive the 'BioWrap' tabs. Please review for format and accuracy of assumptions
 - a) For BioWrap A, I've changed the assumption for the ratio of Biomax/EcoFlex from 80/20 to 20/80. This was changed once the formulae for the Formulation section were improved (see Note 4) and effectively showed that there was not enough Ecoflex raw material to feed both the Masterbatch compounding and final compounding requirements. Kishan - I worked through these original assumptions with you. I may have transposed them incorrectly from the beginning, but nevertheless, I need you to verify and sign-off on the Raw Material and Formulation percentages presented in this version.
- 2) Per Scott's request, I have procured the Bioplast formulations from Biotec. This is **VERY SENSITIVE** data and was provided to me after I assured Harald that I would keep this information strictly confidential. Please help me retain my integrity and inside relationship with Biotec by exercising extreme caution with this information. Please do not share this information outside of our internal Wrap project team, i.e. those to whom this e-mail is addressed.
- 3) By understanding Biotec's formulation, I have now been able to compare the BioWrap A and G on an equal basis, when evaluating the economics of the Target - High Commerical Volume case. This information has allowed the model to demonstrated that, on Raw Material cost alone, these two wraps have similar economics.
- 4) The formulae for each BioWrap's Formulation section were improved in order to accept the detailed Bioplast formulation (The previous model version used an inherently limiting logic to drive the Raw Materials from the Formulation assumptions; This current version's logic more appropriately drives the Formulation from the Raw Material assumptions). Although BioWrap A does not use the Bioplast material, I wanted both comparisons (A & G) to treat the Formulation section in the same manner. This led to a fairly intense (IMHO) matrix to clearly show how a set of raw materials is compounded into masterbatches and then compounded again into the final resin to be blown. This matrix for both BioWrap A and G can be found on the "REF. ONLY - Calc" tab. This tab details the same calculations used on the 'BioWrap' tabs to derive the Formulation section.
 - a) There is probably a better way to present how the Formulation percentages are calculated. The formulae are themselves not intense, but I believe the logic requires some 'quiet time'. I would like your review and input.
- 5) Kishan/Randy - I want to make absolutely sure that I have properly represented the raw materials relative to the masterbatches. For instance, does the "Whitener - TiO2" raw material truly relate to the "Ecoflex / 64% TiO2/BaSO4"

masterbatch?

Please note that all improvements to the model have focused on the BioWrap A & G ONLY. Hence, tabs not addressed are prefaced by a "NOT USED" in the tab names. I will return to the other samples (if need be) after we have collectively 'nailed' the format, etc for BioWraps A & G.

Thank you very much for your support and constructive criticism to improve the accuracy and usefulness of the Wrap Model.

Take Care,
Matt

EarthShell Corporation
Biodegradable Wrap Model

BioWrap G (ES #2), printed, paper-like tissue, 30 micron

**Bioplast 105/30/W20, 3% SiO₂, 3% TiO₂, 22% CaCO₃ filled, plain, paper-like tissue, 30 micron
 Bioplast 105/30/W20, 3% SiO₂, 3% TiO₂, 22% CaCO₃ filled, plain, paper-like tissue, 30 micron
 15" x 15"**

	Weight Mix ratios Fin. Prod.	Mstr Batch mat req'd g/piece	Minimum Commercial Volume		High Commercial Volume	
			Price/LB \$	Cost/1000 \$	Price/LB \$	Cost/1000 \$
Raw Materials:						
Bioplast GF 105/30/W20:						
Ecoflex FBX	4.21%	(a)			4.28	
PLA	20.32%	(a)			2.64	
Lexanid	1.21%	(a)			0.05	
Loxol	1.23%	(a)			0.02	
K21	1.23%	(a)			0.05	
Masterbatch white	1.99%	(a)			0.60	
Anti-block - SiO ₂	3.05%	(a)			0.04	
Whitener - TiO ₂	2.09%	(a)			0.28	
Inorganic Filler - CaCO ₃	22.09%	(a)			0.18	
Raw Materials	1.60400%		1.18		2.63	
						8.15
Formulation:						
Masterbatch Compounding:						
Bioplast GF 105/30/W20	50.3%		2.11	(b)	7.39	
Ecoflex (Assume) 60% SiO ₂	3.0%		0.21	(a)	0.69	
Ecoflex 64% TiO ₂ /BaSO ₄	4.7%		0.20	(b)	0.56	
Ecoflex / 55% CaCO ₃	41.9%		1.68	(b)	5.37	
Formulation	100.0%		4.20		14.17	
Combined film converting process						
Separate converting processes						
Blowing:						
Sheeting:						
Slitting:						
Printing:						
Embossing:						
Sheeting:						
Associated:						
Separate converting processes						
Cost of Manufacture						
Markup						
Target Selling Price			31.05		14.21	

Notes:
 (a) Used for calculating High Commercial Volume cost per 1000; i.e. single compounding step.
 (b) Used for calculating Minimum & Current Commercial Volume cost per 1000; i.e dual compounding step.

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Biodegradable Wrap Model

Check Formulation Calculation

BioWrap A

	Biomax 6926	Ecoflex FBX	Anti-block - SiO2	Whitener - TiO2	Inorganic Filler - CaCO3
1		13.40	53.60	3.00	5.00
2		-3.00	-23.27	-3.00	-5.00
3		10.40	30.33	0.00	0.00

BioWrap G

	Bioplast GF 105/30/W20		Anti-block - SiO2	Whitener - TiO2	Inorganic Filler - CaCO3
1		72.00		3.00	3.00
2		-21.69		-3.00	-3.00
3		50.31	0.00	0.00	0.00

Bioplast GF 105/30/W20

	Ecoflex FBX	PLA	Slipping Agent	Loxamid	Loxiol
1	0.6601	0.2829	0.0094	0.0031	0.0031
1a	47.5272	20.3688	0.6768	0.2233	0.2233
2	-21.6875	25.8397	0.6768	0.2233	0.2233

	0.5	0.64	0.55	
Biomax / 50% SiO2	Ecoflex / 64% TiO2/BaSO4	Ecoflex / 55% CaCO3	Total	
	0.00	0.00	0.00	100.00
	6.00	7.81	45.45	0.00
	6.00	7.81	45.45	100.00

	0.6	0.64	0.55	
Ecoflex / (Assume) 60% SiO2	Ecoflex / 64% TiO2/BaSO4	Ecoflex / 55% CaCO3	Total	
	0.00	0.00	0.00	100.00
	5.00	4.69	40.00	0.00
	5.00	4.69	40.00	100.00

	Masterbatch white		Total	
K21	0.0031	0.0476	1.00	
	0.2233	3.4272	72.00	
			-21.69	
	0.2233	3.4272	0.0000	50.31

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Biodegradable Wrap Model

Material & Process Pricing

Description	Low Volume		High Commercial Volume		Notes:
	Current	Future	Target	Volume	
Inorganics - \$ per pound					
Talc - SiO ₂	0.14	0.14	0.14	0.14	Verified with Randy
Whitener - TiO ₂	0.99	0.99	0.99	0.99	Verified with Randy
Limestone - CaCO ₃	0.09	0.09	0.09	0.09	Verified with Randy
Resin - \$ per pound					
Biomax 6926 - DuPont (Rigid)	1.20	1.00	1.00	1.00	Target price assumes compounding cost included.
Ecoflex FBX - BASF (Flexible)	1.23	1.01	0.97	0.97	\$1.20 provided by Simon based upon talks with Dupont 5.80DM/kg up to 8,000 tons; 4.800DM<>4.600DM/kg up to 30,000 tons
Masterbatch Compounding by Biotec - \$ per pound					
Bioplast GF 105/30/W20	1.59	1.59	1.27	1.27	7.50DM/kg for Low and Minimum Commercial = 6.0DM Raw Mat. + 1.5DM Compounding 6.00DM/kg for High Commercial = 4.5DM Raw Mat. + 1.5DM Compounding
Masterbatch Compounding by Techmer PM - \$ per pound					Masterbatch compounding costs will remain relatively high without competition
** applies to masterbatch only**					
Ecoflex / 55% CaCO ₃	1.85	1.85	1.45	1.45	
Ecoflex / 64% TiO ₂ /BaSO ₄	2.05	2.05	1.65	1.65	
Ecoflex / (Assume) 60% TiO ₂	1.90	1.90	1.50	1.50	
Biomax / 61% CaCO ₃	1.90	1.90	1.50	1.50	
Biomax / 53% TiO ₂ /BaSO ₄	2.10	2.10	1.70	1.70	
Biomax / 50% SiO ₂	2.02	2.02	1.62	1.62	
Process - \$ per pound					
Combined in-line (DuPont? BASF?)			0.30	0.30	Cocktail" produced at primary, but not blown.
Blowing - \$ per pound					
Gemini Plastics	0.36	0.36			
Transamerica Plastics	0.52	0.32			
Polymer Packaging	0.35	0.32			
Casting - \$ per pound					
Not Considered					
Slitting - \$ per 1000					
Gemini Plastics	0.18	0.18			

	Current	Future
Given: \$3.60/hr or \$0.60/min. Assume: 150'x15" part.		
Given: \$3.60/hr or \$0.60/min. Assume: 300'x15" part.		
Given: \$3.60/hr or \$0.60/min. Assume: 360'x15" part.		

Transamerican Plastics	0.33	0.33	Assume: 45" machine or 3 parts wide. So:3600 / 15 = 240 parts/min. So: 240 x 3 = 720 parts/min. So:1.0833 / 720 = \$0.0015/part Given: \$65/hr or \$1.0833/min. Assume:300 ft/min or 3600 in/min. Assume: 15"x15" part. Assume: 45" machine or 3 parts wide. So:3600 / 15 = 240 parts/min. So: 240 x 3 = 720 parts/min. So:1.0833 / 720 = \$0.0015/part
Printing - \$ per 1000			
Transamerican Plastics	2.90	2.90	Given: \$125/hr or \$2.0833/min. Assume:300 ft/min or 3600 in/min. Assume: 15"x15" part. Assume: 45" machine or 3 parts wide. So:3600 / 15 = 240 parts/min. So: 240 x 3 = 720 parts/min. So:2.0833 / 720 = \$0.0029/part
Associated Polybag	2.80	2.80	Given: \$120/hr or \$2.00/min. Assume:300 ft/min or 3600 in/min. Assume: 15"x15" part. Assume: 45" machine or 3 parts wide. So:3600 / 15 = 240 parts/min. So: 240 x 3 = 720 parts/min. So:2.00 / 720 = \$0.0028/part
Embossing - \$ per 1000			
Gemini Plastics	1.00	1.00	Given: \$45/hr or \$0.75/min. Assume:300 ft/min or 3600 in/min. Assume: 15"x15" part. Assume: 45" machine or 3 parts wide. So:3600 / 15 = 240 parts/min. So: 240 x 3 = 720 parts/min. So:0.75 / 720 = \$0.001/part
Transamerican Plastics	0.90	0.90	Given: \$37/hr or \$0.6167/min. Assume:300 ft/min or 3600 in/min. Assume: 15"x15" part. Assume: 45" machine or 3 parts wide. So:3600 / 15 = 240 parts/min. So: 240 x 3 = 720 parts/min. So:0.6167 / 720 = \$0.0009/part
Sheeting - \$ per 1000			
Transamerican Plastics	5.10	5.10	Given:\$37/hr or \$0.6167/min. Assume:120 parts/min. So:0.6167 / 120 = \$0.0051/part Sheeting's limiting factor is 'catching' the sheeted wraps as they come off of the machine, i.e. manual limitation
Freight - \$ per pound fob Primary Source	0.05	0.05	0.05

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Biodegradable Wrap Model

BioWrap B, clear, 37 micron

Ecomax 20/80, 5% SiO₂, clear, 37 micron
15" x 15"

	Weight Mix ratios Fin.Prod.	mat req'd g/piece	Minimum Commercial Volume			High Commercial Volume		
			Future \$	Price/LB Cost/1000	\$	Price/LB Cost/1000	\$	Target \$
Raw Materials:								
Biomax 6926	70.0%	4.27	(b)	1.00	9.41	1.00	9.41	
Ecoflex FBX	20.0%	1.22	(b)	1.01	2.73	0.97	2.62	
Masterbatch Compounding:								
Biomax 50% SiO ₂	0.0%	0.61	(b)	1.45	1.95	0.00	0.00	
Total Raw Materials		0.31		0.67				0.67
Formulation:								
Biomax 6926								
Ecoflex FBX								
Masterbatch Compounding:								
Biomax 50% SiO ₂								
Total Formulation	100.0%	6.10		14.09				12.03
Combined film converting process								
Separate converting processes								
Blowing:								
Gemin		6.10	0.00	0.00	0.30	0.00	0.00	4.03
Slitting:								
Gemin		6.10	0.36	4.84	0.00	0.00	0.00	0.00
Printing:								
No		0.00						0.00
Embossing:								
No		0.00						0.00
Sheeting:								
Transamerican		5.10						0.00
Separate converting processes								
Cost of Manufacture				24.89				16.74
Markup		30%		39.65				33.47
Target Selling Price				11.90				10.04
				51.55				43.51

Notes:

- (a) Used for calculating High Commercial Volume cost per 1000; i.e. single compounding step.
- (b) Used for calculating Minimum & Current Commercial Volume cost per 1000; ie dual compounding step.

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Biodegradable Wrap Model

BioWrap C, printed, 25 micron
Bioplast 105/30/W20 Carl's Jr. print, 25 micron
14" x 14"

	Weight Mix ratios Fin.Prod.	mat req'd g/piece	Minimum Commercial Volume			High Commercial Volume		
			Future \$	Price/LB Cost/1000	Target \$	Price/LB Cost/1000	Target \$	Price/LB Cost/1000
Raw Materials:								
	(a)	0.00 (b)	0.00	0.00	0.00	0.00	0.00	0.00
	(a)	0.00 (b)	0.00	0.00	0.00	0.00	0.00	0.00
Total Raw Materials			0.00			0.00		0.00
Formulation:								
Masterbatch Compounding:								
Bioplast GF 105/30/W20	[REDACTED]		5.00 (b)	1.59 0.00 0.00	17.48 0.00 0.00	1.27 0.00 0.00	13.98 0.00 0.00	
Total Formulation	100.0%	[REDACTED]	5.00		17.48		13.98	
Combined film converting process								
Separate converting processes								
Blowing:	[REDACTED]		5.00	0.36	3.97	0.00	0.00	
Slitting:	[REDACTED]				0.18		0.00	
Printing:	[REDACTED]				0.00		0.00	
Embossing:	[REDACTED]				0.00		0.00	
Sheeting:	[REDACTED]				5.10		0.00	
Separate converting processes						26.72	17.29	
Cost of Manufacture						44.20	34.58	
Markup						13.26	10.37	
Target Selling Price						57.46	44.95	

Notes:

- (a) Used for calculating High Commercial Volume cost per 1000; i.e. single compounding step.
- (b) Used for calculating Minimum & Current Commercial Volume cost per 1000; ie dual compounding step.